Preface

Magnetic reconnection is widely believed to be a key process in the dynamics of cosmic plasmas and laboratory plasmas. Many plasma states in space have magnetic fields whose structure contains the neutral sheet where the magnetic field polarity changes its direction, and plasma heating/acceleration and mixing occur over a broad range of the plasma regions. Magnetic reconnection is widely believed to be particularly important, because the magnetic field energy can be rapidly released to the particle energy.

The basic theory of magnetic reconnection was established by Parker, Sweet, and Petschek in the middle sixties, following earlier ideas were proposed by Giovanni and Dungey. The rate of magnetic reconnection is controlled by the geometry of the dissipation region, where the ideal magnetohydrodynamic description breaks down and the so-called frozen-in condition is violated. It is important to understand how the macroscopic reconnection system responds to the microscopic energy dissipation region, and vice versa. Plasma physicists, space and astroplasma physicists have made great strides in understanding the physics of magnetic reconnection by means of modern satellite observations, laboratory experiments and theoretical/computational investigations.

This issue is based on a University of Tokyo Symposium in 2000 on "Magnetic Reconnection in Space and Laboratory Plasmas" and contains most of the papers presented at the conference. The conference was held at the University of Tokyo February 29–March 4, 2000 and was attended by 120 scientists. The symposium comprised four general sessions of 1) Laboratory Plasmas, 2) Solar Plasmas, 3) Magnetospheric Plasmas, and 4) Astrophysical Plasmas, together with four topical sessions focusing on (i) Sweet-Parker vs Petschek & Driven vs Spontaneous reconnections, (ii) Origin of resistivity & Current-sheet structure, (iii) Global dynamics & 3-D effect of reconnection, and (iv) Summary of our present understanding of reconnection & perspective beyond this conference. Our understanding towards the large-scale reconnection process under a distinct kinetic and multi-scale structure becomes more mature than before.

The outstanding success of the symposium resulted from the efforts on many people and organizations. We thank the speakers and the scientists who reviewed the papers submitted for publication. The symposium was organized by the Chairpersons, Y. Ono, K. Shibata and T. Terasawa, the Scientific Organizing Committee members, D. Biskamp, M. Katsurai, K. Makishima, A. Nishida, E. R. Priest, T. Sato, M. Scholer, R. Stenzel, S. Tsuneta and M. Yamada, and the Local Organizing Committee, R. Matsumoto, T. Yokoyama, A. Ejiri, T. Itagaki, T. Kosugi, H. Kurokawa, T. Mukai, T. Shimizu, Y. Takase, M. Ugai, Z. Yoshida and M. Hoshino. We are pleased to acknowledge the efforts of the all members. Finally, we are grateful for the sponsorship and support of University of Tokyo.

June 2001

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